

Headquarters U.S. Air Force

Integrity - Service - Excellence

Air Force Renewable Energy Programs April, 2011 FUPWG

“Make Energy a Consideration in All We Do”



U.S. AIR FORCE



**Ken Gray P.E.
HQ AFCEA /CENR**



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Topics

- **Air Force Energy Use**
- **Air Force Facility Energy Center**
- **Current RE Generation**
- **Project Development System**
- **Programmed RE Generation FY11-13**
- **Goal Achievement**



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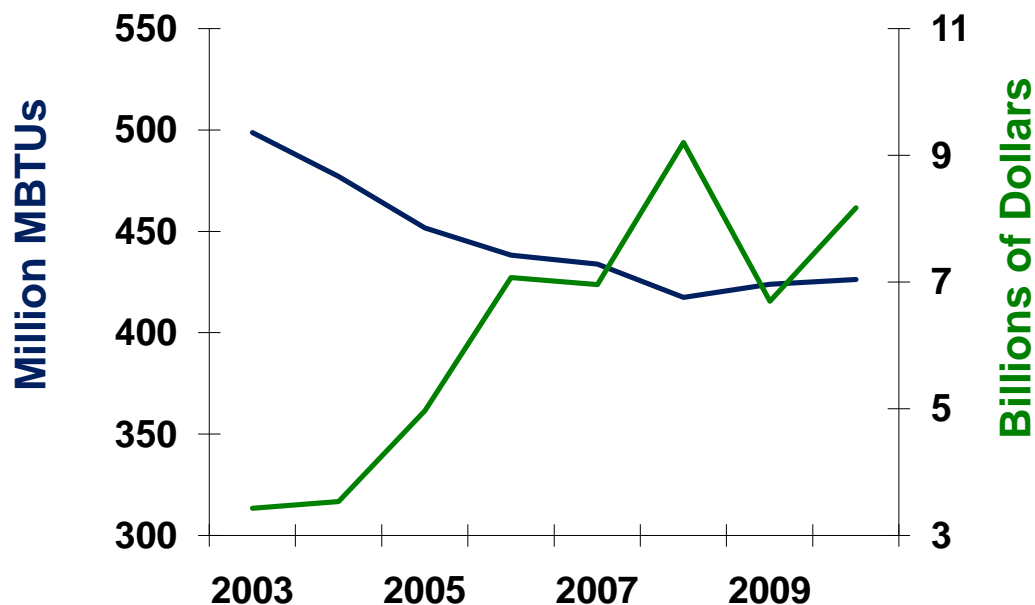
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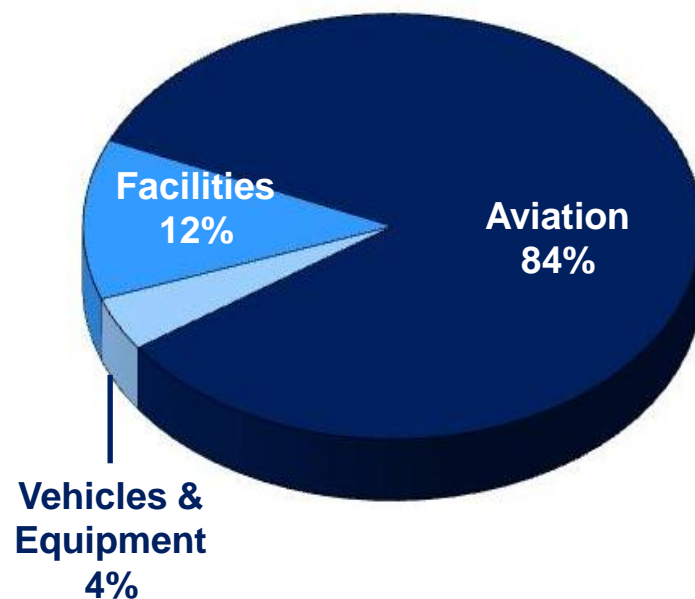
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Air Force 2010 Energy Use

Energy Cost and Consumption Trends



Energy Cost Breakdown



The Air Force spent approximately \$8.2 billion for energy in 2010; an increase of 22% from 2009



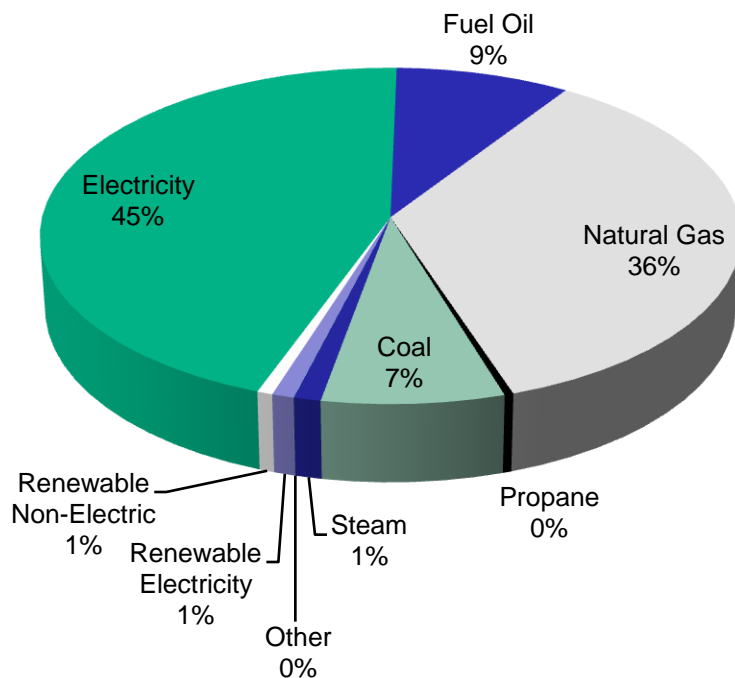
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FY10 Air Force Facility Energy Use/Cost

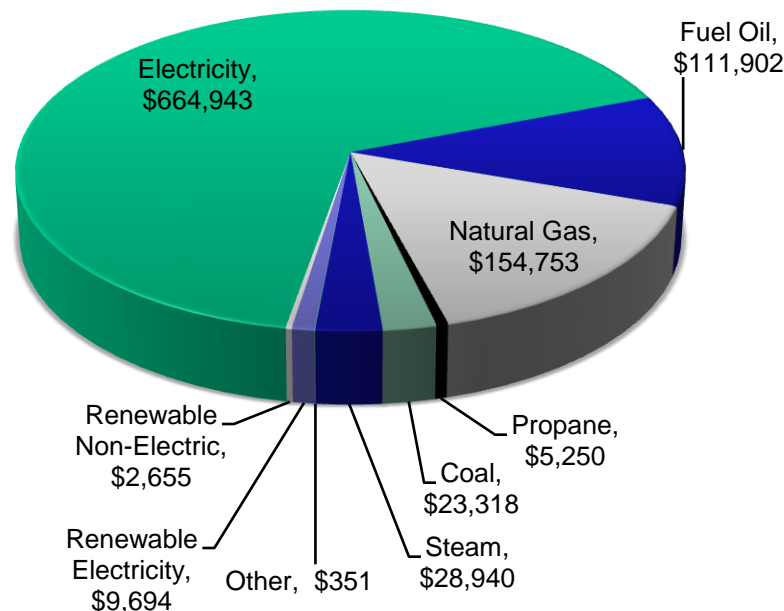
FY10 ENERGY USE



64.2 Trillion BTU

67.7 Trillion BTU in FY09
5.1% Decrease From FY09

FY10 ENERGY COST (\$000)



\$1,001,806

\$1,131,243.80 in FY09
11.4% Decrease From FY09

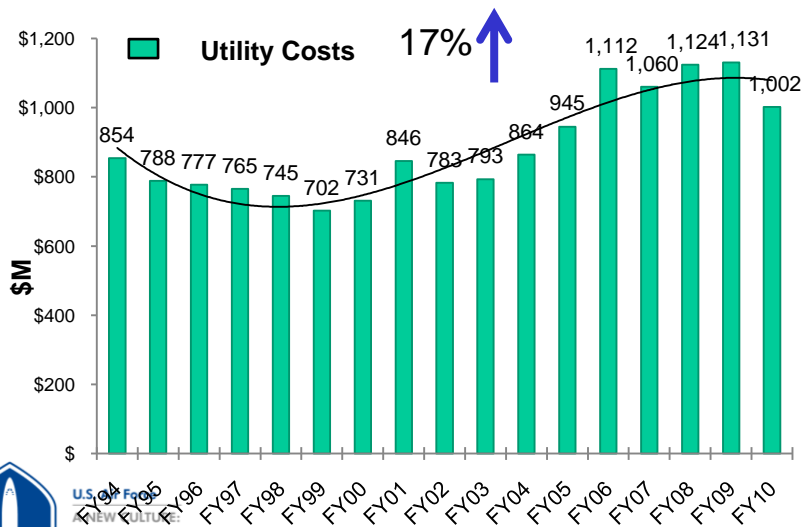
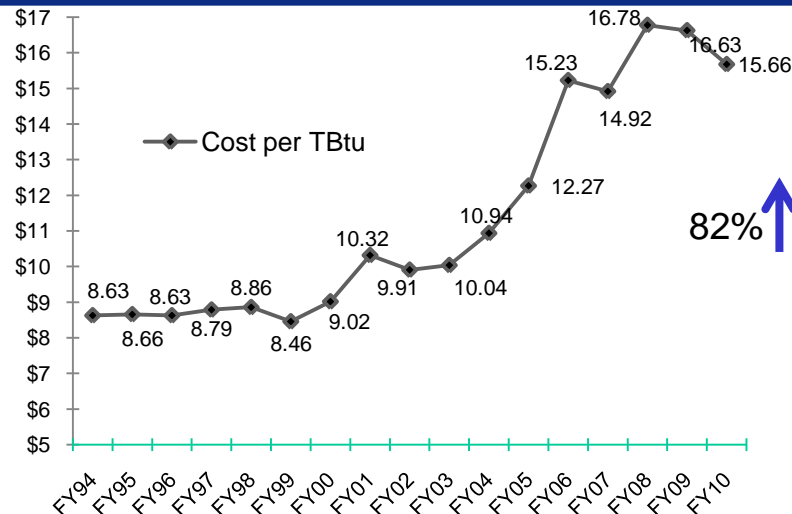
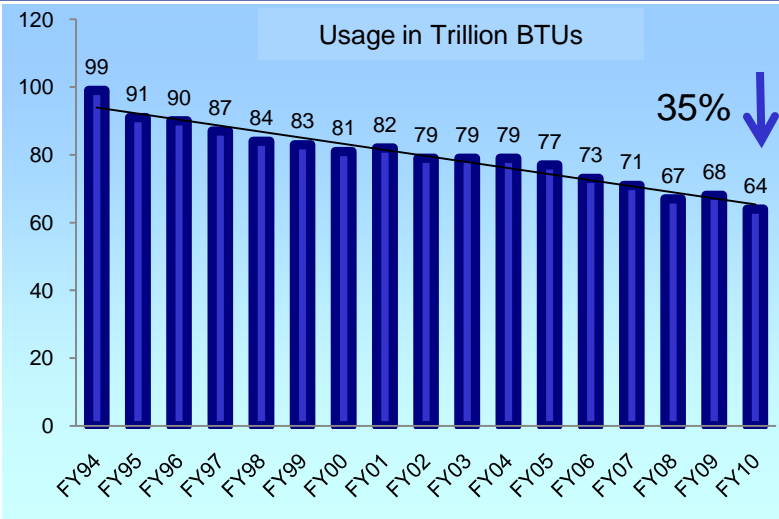
SOURCE: FY10 ANNUAL ENERGY MANAGEMENT REPORT TO CONGRESS

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Facility Energy Cost Trend

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Over the last 16 years:

AF Utility Costs trend upward:

- 35% consumption reduction does not overcome 82% unit cost increase
- 35% consumption reduction translates to \$517M cost avoidance in FY10

Good News in FY10:

- Costs down 13% from FY09; 6.25% less consumption coupled with 6.75% commodity cost decrease



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AF Civil Engineering Support Agency

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2010 Industry Day

2010 Industry Day will be held May 19 at the Gay Point Marriott, Panama City Beach, Fla.

In its fourth year, Industry Day continues to be a valuable opportunity to share information and ideas between the Air Force and industry partners. Hosted by AFCESA, in conjunction with the Panama City Post of SAUSC, activities at this year's event will reflect the strategic focus within the Air Force Civil Engineer community.

Registration is available online at: www.afce-sa.com/industryday

The 2010 Industry Day Agenda is available [here](#).

For additional information contact Mr. Calvin Roberts at 855-233-6272.

Civil Engineering Subject Matter Expert Directory

2009 Directory of Civil Engineering Subject Matter Experts

This special issue focuses on Air Force Civil Engineering's subject matter experts or SMEs. If you would like a hardcopy of the SME directory, please email carag@tyndall.af.mil or call 855-233-6242.

Air Force Facility Energy 2009

Read Air Force Facility Energy 2009 to see how civil engineers contribute to the Air Force's energy successes.

Civil Engineers in the News

AFCESA Airfield Pavement Civilianization Team: Headed to Italy!

Investing in Energy Conservation Capacted to Save Millions

Focus on Sustainability and Energy Efficiency wins Air Force Federal Energy Awards

AFCESA Sargant wins DOD award

Spotlights

Air Force Facility Energy 2009

Inside AFCESA

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Contact Information

MC AFCESA
136 Barnes Dr Suite 1
Tyndall AFB FL 32403-5319
1-855-233-6271
OSN 523-6265

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Photo essay: Angel Thunder 2010 ACMA

Air Force official unveils new aircraft model

Inaugural warrior and survivor care conference held

Airmen deliver new Army helicopter to war zone

Air Force official cancel officer training boards

Airmen participate in NATO exercise

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AFCEA Energy Division -Facility Energy Center

- **AF funding focused on conservation and capital investment for existing facilities**
- **Evaluate and then codify applications of proven and accepted technologies to meet AF energy objectives**
- **Existing, permanent facilities focus**
- **Develop renewables for clean reliable energy, meet mandates**
- **Incorporate emerging technology into Air Force facility standards as provided by AFRL**



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AFFEC Vision Statement

*Drive facility energy reduction,
Leverage RE investments,
Exploit utility cost savings,
Privatize utilities infrastructure*



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Renewable Technologies

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- **Solar**
- **Wind**
- **Biomass**
- **Landfill Gas**
- **Geothermal**
- **Ocean**
- **Hydropower**
- **Waste to Energy**
- **Ground Source Heat Pumps**



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Renewable Energy Goals and Strategy

- **First Priority: Develop on-site renewable resources**
 - **Direct AF investment (ECIP or SRM/NRG)**
 - **Renewable Energy Power Purchase Agreements (REPPAs)**
 - **Utility/Third Party Funded**
- **Second Priority: Procure renewable power from off-site resources delivered over the power grid**
- **Third Priority: Purchase Renewable Energy Certificates (RECs)**
 - **Replacement RECs**
 - **Goal Attainment**



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Renewable Energy Power Purchases Agreements (REPPA)

- **REPPA advantages over direct AF funded projects**
 - **REPPA Developer can hold and sell RECs in the marketplace**
 - **REPPA Developer can leverage RE incentives and tax benefits**
 - **REPPA Developer/Utility respond to State driven Renewable Portfolio Standard (RPS)**

- **Direct funded projects are less economical than REPPA**
 - **AF cannot currently sell RECs or leverage benefits**
 - **AF must maintain and operate**

REPPA provides lower cost energy solutions.



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Why Not Invest More on Govt Owned RE??

- RE goal: 25% of AF electric consumption by 2025
 - AF used 9,000,000 MWH in 2009
 - 25% is 2,250,000 MWH requirement
- 14.2 MW Nellis PV produces: 28,570 MWH
 - Nellis project cost: \$100M
 - # Nellis-size projects needed: 78.75 (140 acres each)
- Cost to produce 25% via PV: **\$7.9B capital investment**
 - Assumes hours sunlight & efficiency equal to Nellis
 - Not feasible in many locations in the US
- Other
 - Buckley PV \$7.3M/1MW Output: 1,456 MWhr/Yr (est)
 - MMR Wind \$4.5M/1.5MW Output: 4,599 MWhr/Yr



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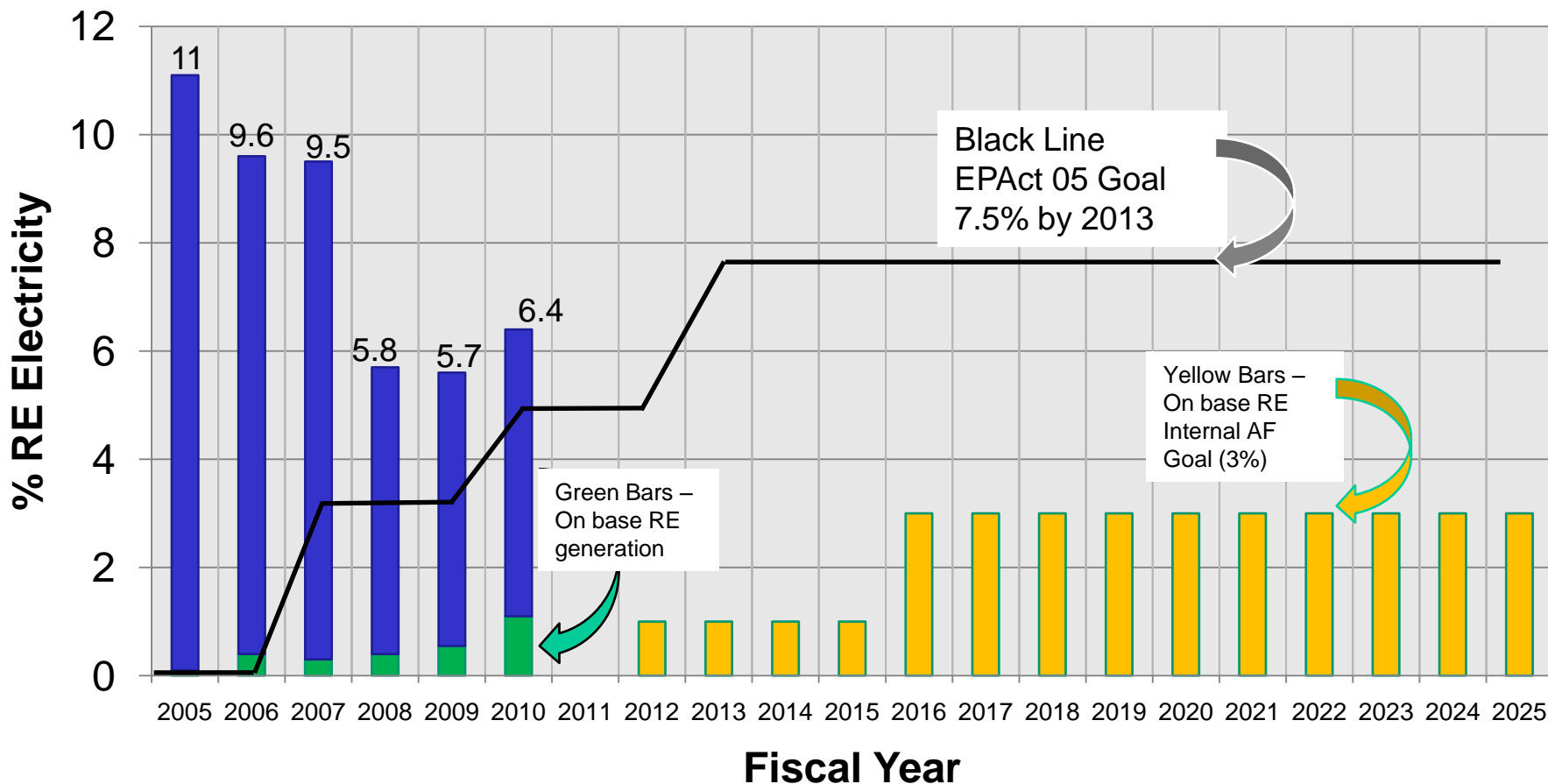
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Renewable Power Status EPACT 2005

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Operational On-Base (Top Ten) Renewable Electric Generation

	<u>Tech</u>	Status	Generation MWH/yr
NELLIS AFB, NV	Solar Photovoltaic	Fully Operational	33,933
HILL AFB, UT	Landfill Gas	Fully Operational	15,113
F E WARREN AFB, WY	Wind	Fully Operational	8,725
ASCENSION	Wind	Fully Operational	7,095
TOLEDO ANG, OH	Solar Photovoltaic	Fully Operational	1,006
YOSEMITE AG, CA	Solar Photovoltaic	Fully Operational	942
CAPE COD AFS, MA	Wind	Fully Operational	821
JB MCGUIRE/DIX/LAKH	Solar Photovoltaic	Fully Operational	760
MARCH AFB, CA	Solar Photovoltaic	Fully Operational	732
LUKE AFB, AZ	Solar Photovoltaic	Fully Operational	596
Total - Operational on-base	26 Project Total		71,366



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Renewable Energy Projects

Awarded & In Construction

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Initiative	Source	Cap KW	Bus Case	NEPA	Engy Sec	Eval prop	%Base Energy	Award
AF Academy, CO	PV	6,003	✓	✓	2	✓	11%	2009
Camp Perry ANG, OH	PV	150	✓	✓	2		60%	2010
Los Angeles AFB, CA	PV roof	225	✓	✓	2		2%	2010
AF Academy, CO	PV	550	✓	✓	2	✓	1%	2010
Moron AFB, Spain	PV	1,100	✓	✓	2	✓	35%	2010
Edwards AFB, CA	PV	3,500	✓	✓	2	✓	10%	2010
Davis Monthan, AZ	PV	14,500	✓	✓	2	✓	35%	2010

Energy Security: L1, 24/7 resource, conn to base grid directly; L2, Intermittent resource, conn to base grid directly

L3 – Intermittent resource, not connected to base directly; Does not account for smartgrid or microgrid

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Renewable Electrical Energy

FY 11-12

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Initiative	Source	Cap KW	Bus Case	NEPA	Engy Sec	Eval prop	%Base Energy	Est Award
Luke AFB, AZ	PV	17,000	✓	✓	2	2011	47%	2011
Pave Paws, Eldorado, TX	Wind	9,000	2011	✓	3	2011	TBD	2011
McConnell AFB, KS	Wind	6,000	2011	2011	2	2011	25%	2011
Dyess AFB, TX	WTE	5,400	✓	2011	1	2011	75%	2011
Cape Cod AFS , MA	Wind	3,000	✓	2010	2	2011	75%	2011
Sheppard AFB, TX	PV	3,000	2011	2011	2	2011	10%	2011
Pave Paws MMR, MA	Wind	3,000	✓	2010	2	2011	70%	2011
JB MDL Lakehurst, NJ	PV	1,500	2011	✓	2	2011	10%	2011
JB MDL McGuire, NJ	PV	1,500	2011	2011	2	2011	10%	2011
Cheyenne Mtn, CO	PV	1,000	✓	✓	2	2011	7%	2011
Burlington ANGB, VT	PV roof	918	✓	✓	2	2011	TBD	2011
Atlantic City ANG, NJ	PV	750	✓	✓	2	2010	48%	2011
Ft Stewart ANG, NY,	PV	750	✓	2011	2	2011	20%	2011

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Renewable Electrical Energy

FY 11-12

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Initiative	Source	Cap KW	Bus Case	NEPA	Engy Sec	Eval prop	%Base Energy	Est Award
Tin City LRRS	Wind	250	✓	✓	2	✓	60%	2011
Rosencrans ANG, MO	PV	160	✓	✓	2	✓	15%	2011
Altus AFB, OK	Wind	50	✓	✓	2	✓	0.30%	2011
Nellis AFB, NV	PV	17,000	✓	✓	2	2012	21%	2012
Beale AFB, CA	LFG	4,000	✓		1		57%	2012
Los Angeles AFB, CA	PV roof	355	✓	✓	2		3%	2012

Energy Security: L1, 24/7 resource, conn to base grid directly; L2, Intermittent resource, conn to base grid directly

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Renewable Electrical Energy

FY 13

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Initiative	Source	Cap KW	Bus Case	NEPA	Engy Sec	Eval prop	%Base Energy	Est Award
Vandenberg AFB, CA	Wind	48,000			2			2013
Eglin AFB, FL	Biomass	25,000	✓	✓	1	2011		2013
Whiteman AFB	WTE	3,000			1	2012	10%	2013
Goodfellow AFB, TX	PV	2,000			2		9%	2013
Cape Romanzof LRRS	Wind	500	✓		2			2013
Cape Lisburne LRRS	Wind	500			2			2013
Cape Newenham LRRS	Wind	500	✓		2			2013

Energy Security: L1, 24/7 resource, conn to base grid directly; L2, Intermittent resource, conn to base grid directly

L3 – Intermittent resource, not connected to base directly; Does not account for smartgrid or microgrid

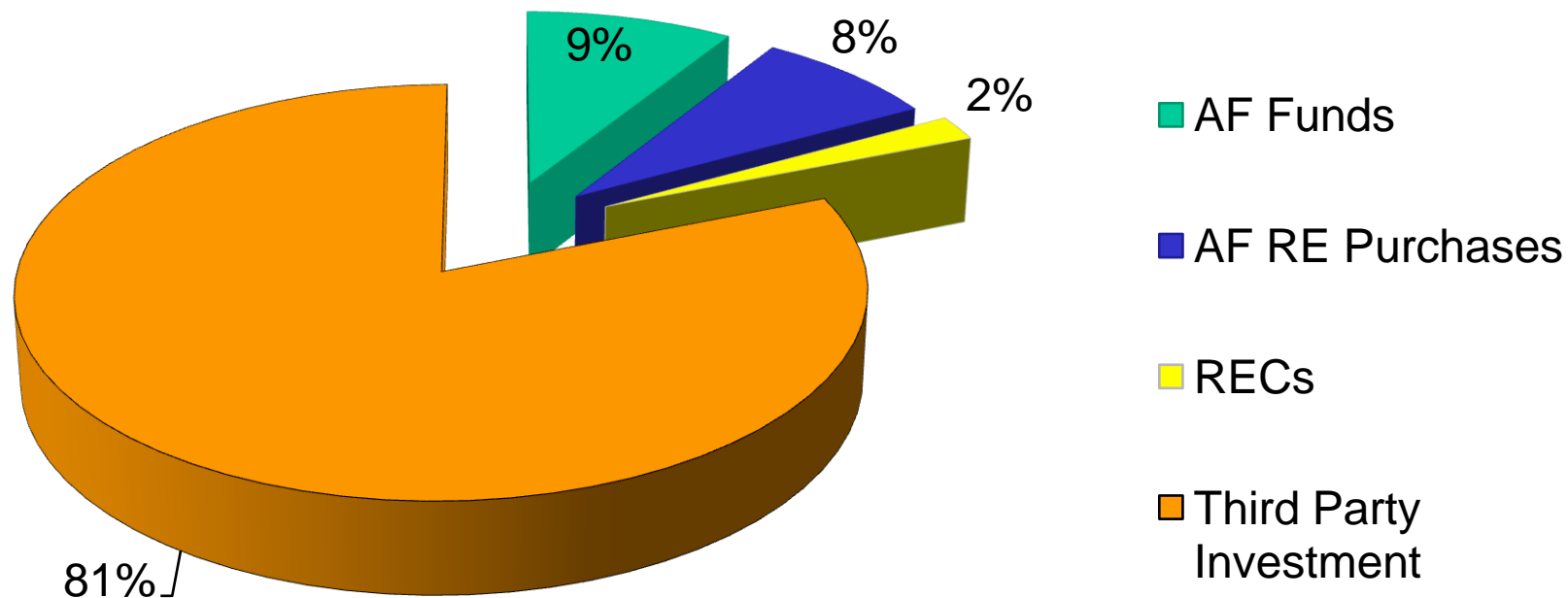
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Renewable Energy Fiscal Strategy Requirements



AF APPROACH: USE THIRD PARTY INVESTMENTS TO MEET GOALS



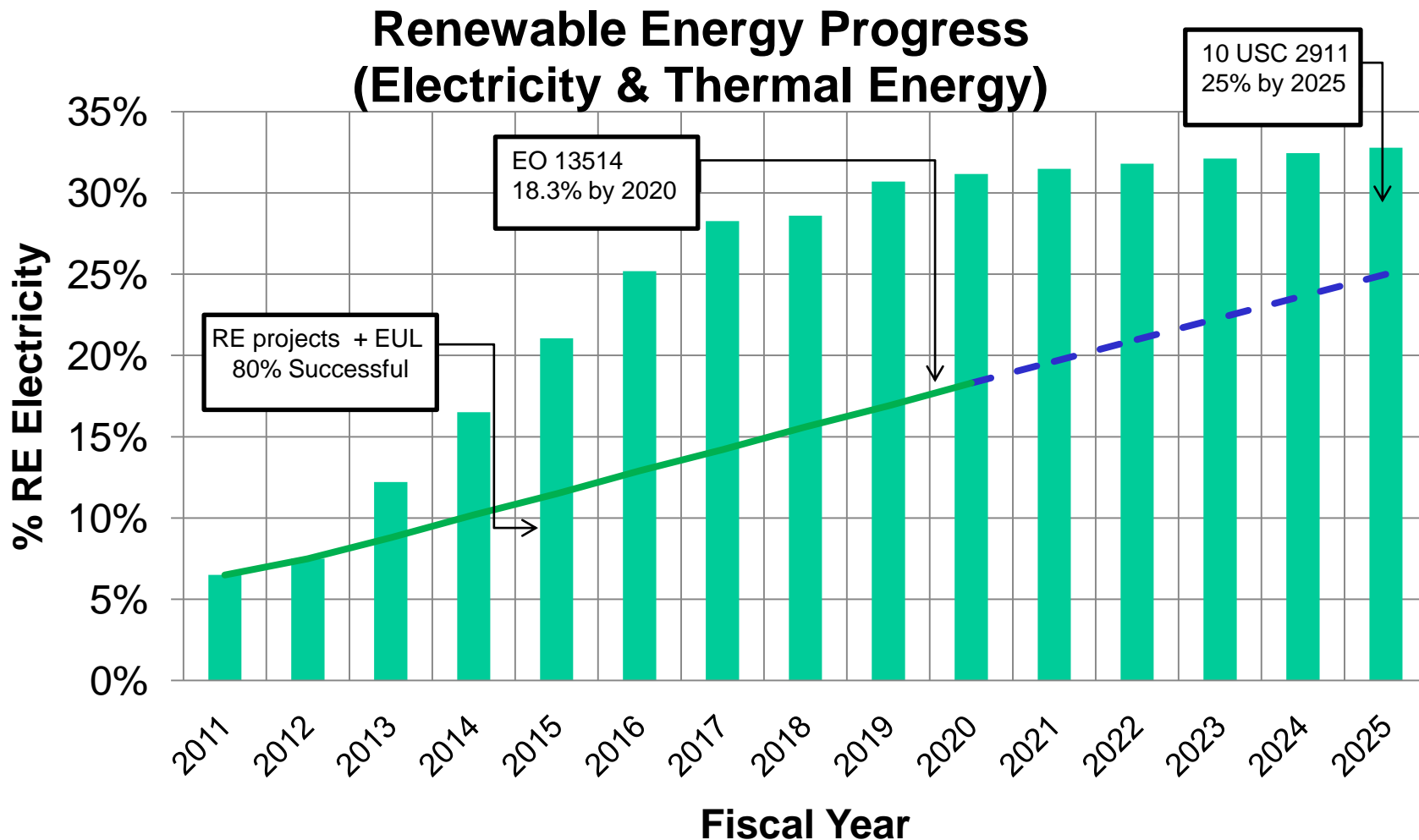
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Renewable Energy Goals



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Renewable Project Development

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- **Feasibility Study:**
 - Looks at renewable energy types e.g. wind, solar, biomass, biogas...
 - No base specific info- land available, mission, siting
- **Opportunity Assessment: IDs Base requirements e.g. mission impact, environmental, land availability, incentives...**
- **Business Case Analysis: crunch the numbers of project details e.g. costs, method of execution, simple payback...**



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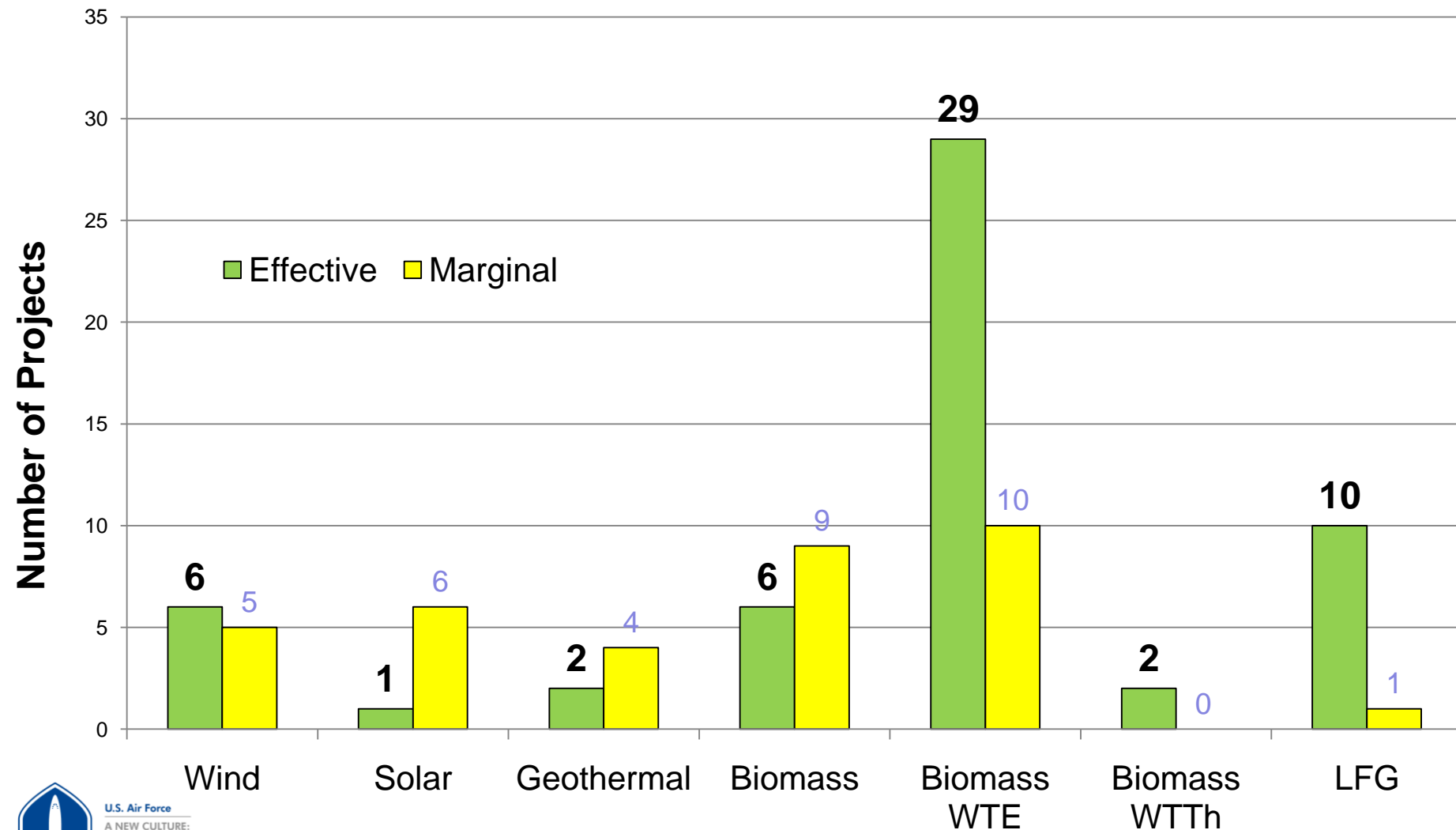
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Early RE Feasibility Results Opportunity by Technology



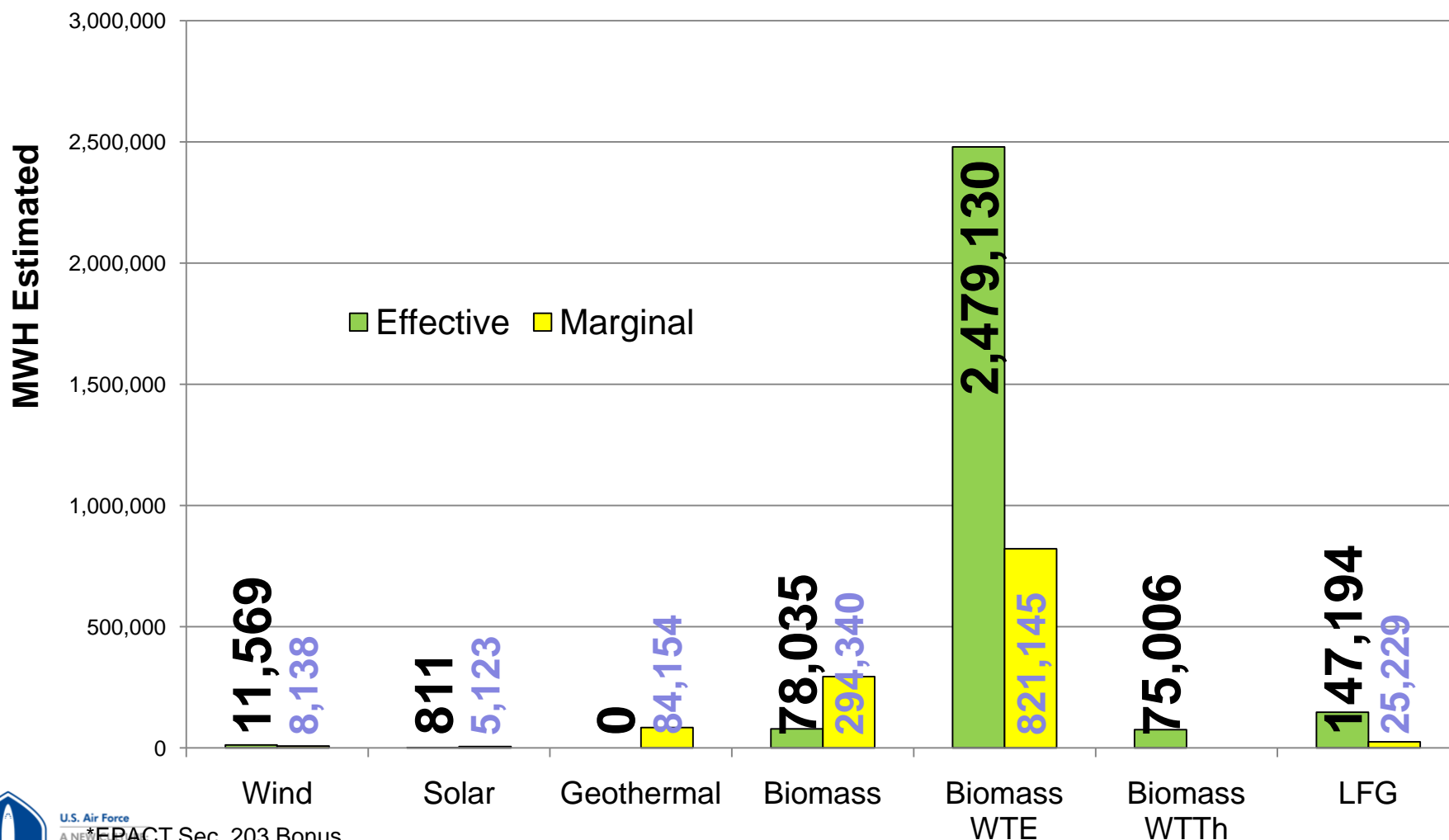
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Early RE Feasibility Results Estimated Energy Production



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*EPA ACT Sec. 203 Bonus

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Waste to Energy Way Ahead

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- Brief and review with Sr. AF Leadership
- Develop Dyess AFB WTE as initial project
- Establish best practices with AFRL, others
- Execute BWTE Opportunity Assessments in FY11, est compl May 2011

Kirtland Air Force Base	NM	Cape Canaveral AFS	FL
Tinker Air Force Base	OK	Travis AFB	CA
Wright-Patterson AFB	OH	McGuire AFB	NJ
Keesler AFB	MS	Patrick AFB	FL
Elmendorf AFB	AK	Luke AFB	AZ
Scott Air Force Base	IL	Laughlin Air Force Base	TX
Andrews Air Force Base	MD	Tonopah Aux Airfield	NV
Tyndall AFB	FL	Los Angeles AFB	CA
Sheppard AFB	TX	Homestead ARB	FL
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Challenges with Utility Solutions

- **Timely resolution of utility company involvement under 40 USC 591**
 - **40 USC 591 requires compliance with State law, use of jurisdictional provider**
 - **Requests for support with renewable projects need a timely response on utility interest - AFCESA position 120 days reasonable**
 - **Negative Utility response allows Air Force to seek SAF approval to competitively procure**
- **Resolution on mutual areas of benefit and execution**
 - **Development of project and categorizing within rate base, dispatch method and other issues**
 - **Challenges with biomass in the Southeast**



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Challenges with Utility Solutions

- Development of RE with utility company
 - Perception of lack of competition to the public
- New Buy American requirement for PV panels
 - NDAA 2010, sec 846
 - Any ESPC, UESC, Utility Service, land lead
 - Ownership test
 - Installed on DoD property
 - Reserved for exclusive use of DoD for economic life of device



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AF Renewable Energy Symposium

- **Next planned industry engagement on AF renewable strategy/plan**
- **Davis Monthan AFB, AZ**
- **June 28-29, 2011**
- **Details being finalized for release**
- **Air Force would like Utility Company involvement**
- **Major role for utility companies as jurisdictional provider, first right for project development**



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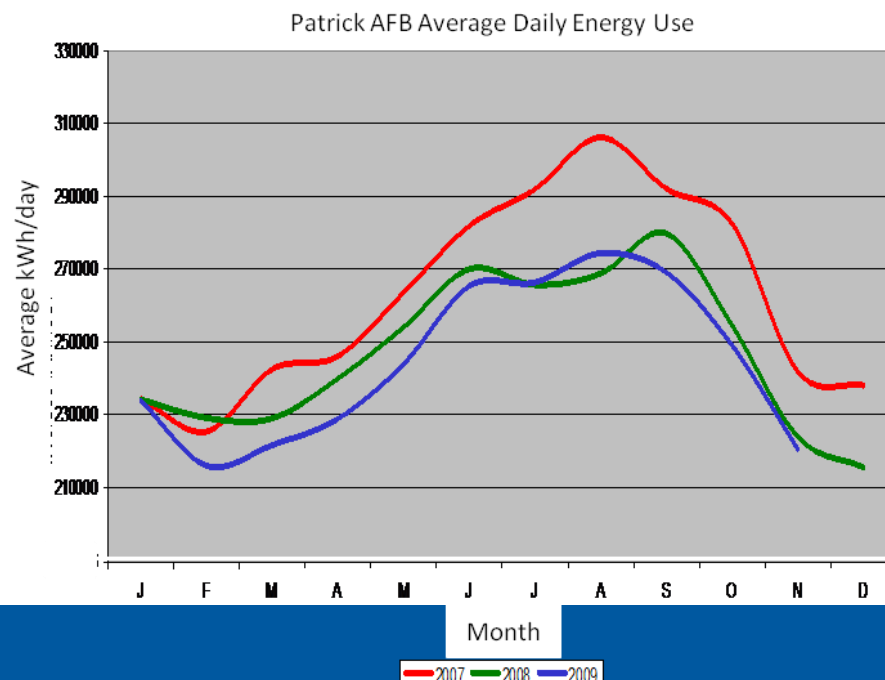
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UESC

- **Reinvigorating Program--New AF Policy allows 3rd Party financing**
 - Encouraging AF installation engagement
- **Centralized management by AFCESA Conservation Branch**
 - Projects do require AFCESA/CEN Approval
 - POC is Mr. Les Martin, 850-283-6475
- **“Win-Win” for Utility Co. & AF to hold down utility costs**
- **“Mutually beneficial long-term partnership with known entity**
- **Helps meet Federal Energy Goals and cut costs!**



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Demand Response Programs

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- **AF installations encouraged to participate and use as able**
- **Balance benefit from peak-shaving cost savings against the associated expense of mission impact**
- **Funds must be returned as a bill credit through the Utility Co., per NDAA 2010, USC 2919**
 - **Demand response aggregator/curtailment service providers may be an Electric Utility Co., an Independent System Operator (ISO), a State agency, or a third-party entity**
- **Federal government cannot accept terms that impose a penalty for non-participation in a curtailment event -- Not allowed under the Federal Acquisition Regulation (FAR).**



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Ken Gray
ken.gray@tyndall.af.mil
850-283-6357

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Davis Monthan PV Array Case Study

- Initial effort to build Waste to Energy at DM met resistance and was unsuccessful
- Reopened discussion with Tucson Power on a solar array, TPE declined to participate and provide requested renewable power
- May 08- began acquisition planning
- Jul 08- issued RFP
- Jan 09- Cancelled RFP
- Dec 09 – Environmental Assessment Completed
- Jan 10 – RFP Reissued
- Apr 10 – Received proposals
- Sep 10- Awarded to Sun Edison



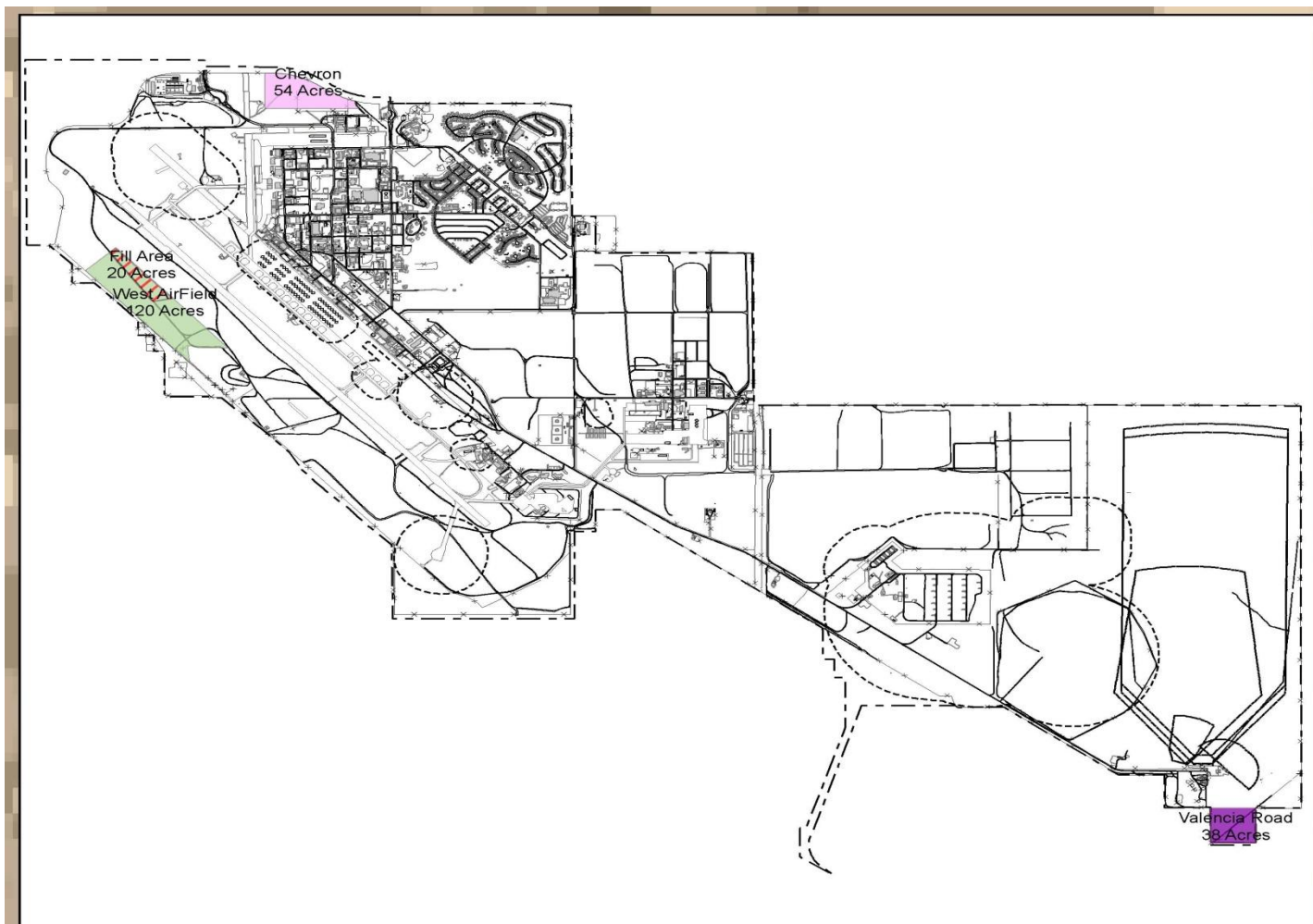
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Davis Monthan PV Array Case Study



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Davis Monthan PV Array Case Study

- **Sun Edison will**
 - **Design, construct, own, operate, maintain 14.5 MW PV array**
 - **Sell power to DM AFB at \$0.045/kWH with 1.5% annual esc**
 - **Sell RECs to Tucson Electric Power to offset DM AFB kWH costs**
- **Davis Monthan AFB will**
 - **Provide land for the array through a land use document**
 - **Sign a standard utility purchase contract with Sun Edison**
- **Average savings of \$500K/ year**
- **Will provide ~ 35% of base electricity needs**



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Davis Monthan PV Array Case Study Lessons Learned

- **Establish land ownership early**
- **REC sale issue had to be considered**
- **Air Force internal site approval/mission impact takes time**
- **NEPA**
 - **Must be well coordinated at beginning**
 - **Typically longest presolicitation requirement**
 - **Rework and delay for additional Fish and Wildlife Study**
- **State law and regulation very critical**
 - **AZ Constitution restriction on sale of electricity only to regulated entities**
 - **Net metering allowed larger project economically**



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Secretary of the Air Force Installations, Environment & Logistics

Installations, Environment & Logistics

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Our Mission

To champion agile and innovative policy development while leading cost-effective execution in Air Force supply chain management, infrastructure and environmental, safety and occupational health, always providing superior, customer-focused support to the warfighter and their families.

Mission Capsule

Support the USAF Transformation Architecture

Roles

- Shape policy direction, conduct oversight and liaison with the Office of the Secretary of Defense, Congress, federal agencies and external organizations
- Provide guidance, direction and oversight of all matters pertaining to the formulation, review and execution of plans, policies, programs and budgets relative to specific functional responsibilities

Our Vision

Our efforts focus on those policies and activities that will transform Air Force operations ultimately ensuring improvements to our warfighting ability and capacity to counter new threats. SAFIE is committed to ensuring our installations are right-sized to support our forces, that our combat systems have a robust logistics infrastructure for sustainment, and that our forces have the necessary accessibility to the full spectrum of our environment to ensure combat readiness.

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Mr. Terry Vaniers
Assistant Secretary of the Air Force
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Air Force Real Property Agency
(210) 925-0966
Toll Free: 1-866-725-7617

Special Interest

AF.mil Video

Luxembourg Cemetery cleanup

10/29/2010 - Every year, thousands of Americans visit the Luxembourg American Cemetery and Memorial. Recently, a group of Air Force personnel made the trip to the cemetery and volunteered to clean the headstones of the fallen heroes.



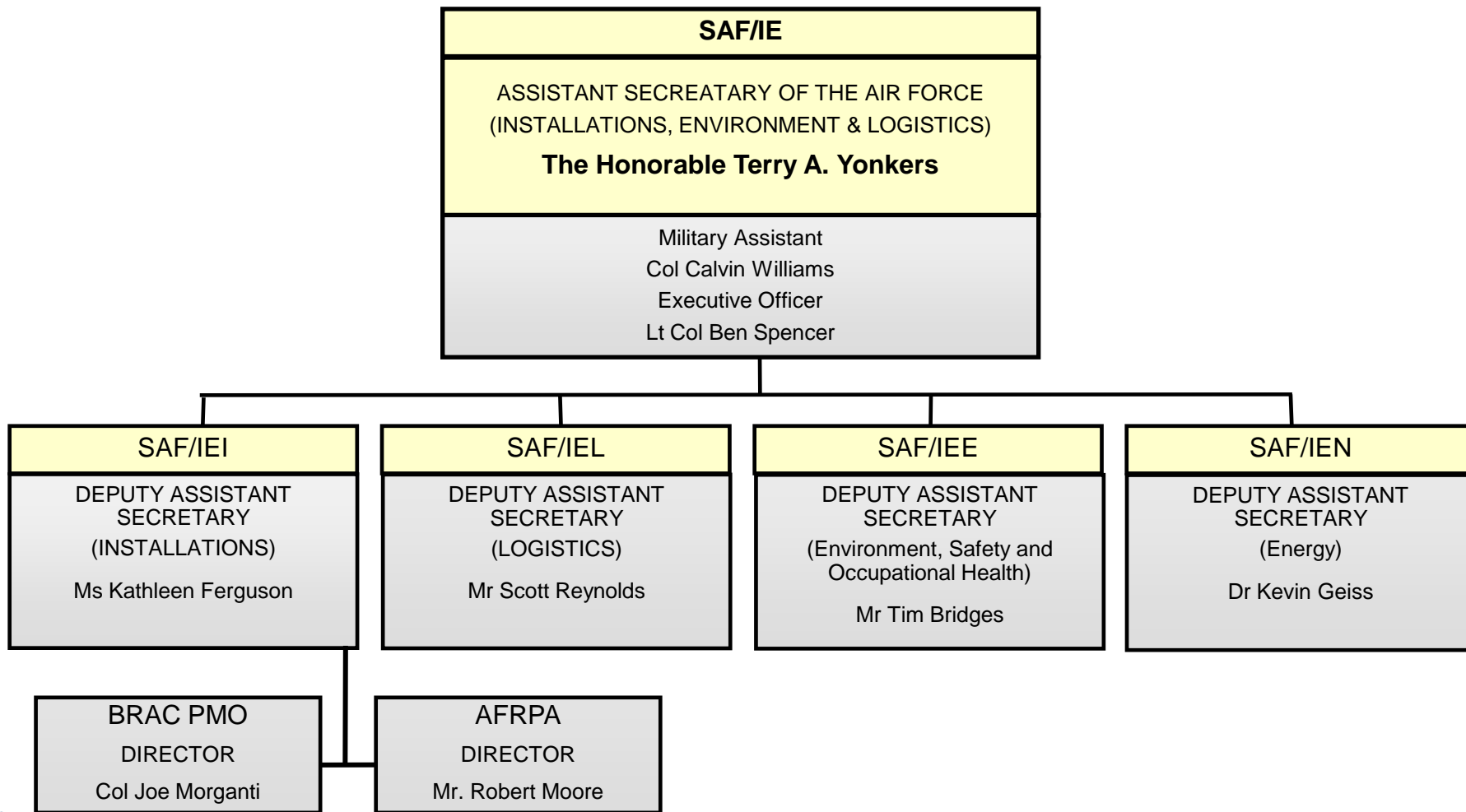
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Assistant Secretary, Installations Environment & Logistics



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SAF/IE (Energy)

Mission: Provide policy, guidance, analysis and oversight for implementing the AF Energy strategy, ensuring energy program governance, and advocate for budget requests to address the Air Force's \$9 Billion energy bill

- **Advance efforts to reduce demand, increase supply, and create cultural change to make energy a consideration in all AF ops**
- **Support SAF/IE and USECAF (AF Senior Energy Official)**
- **Reduce demand (increase conservation, operational refinements)**
- **Increase supply (facilitate alternative fuel/energy & renewables)**
- **Change culture (indoctrination, education, training, reviews)**



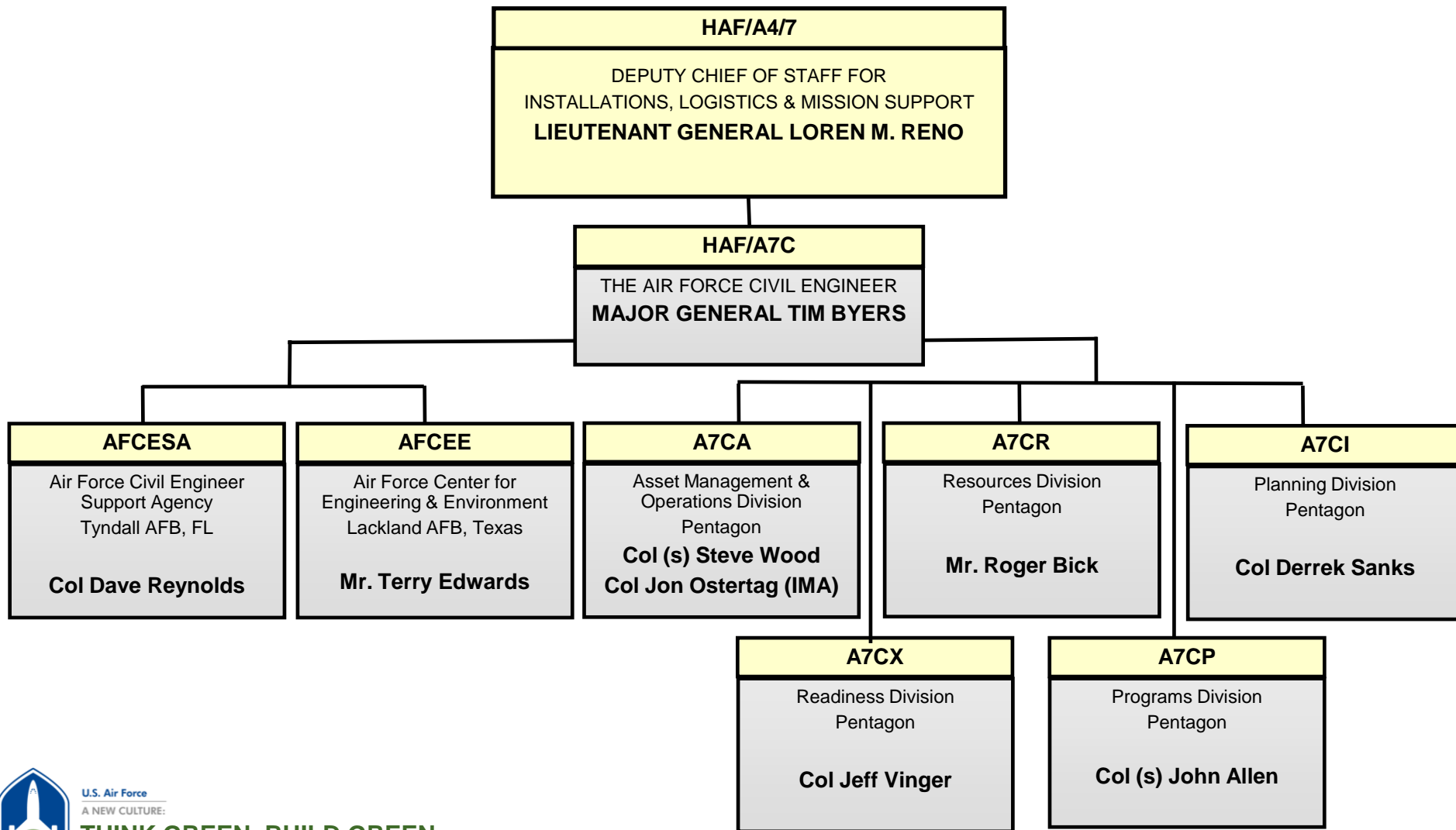
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Logistics, Installations and Mission Support



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Wright-Patterson Air Force Base

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LEAD DISCOVER DEVELOP DELIVER

AFRL is the Air Force's only organization wholly dedicated to leading the discovery, development and integration of warfighting technologies for our air, space and cyberspace forces. We trace our roots to the vision of aerospace pioneers who understood science as key to air supremacy. The passionate commitment of AFRL people to realize this vision has helped create the world's best air, space and cyberspace force.

"We fight today's fight and aviation and create the future Air Force."

Air Force Research Laboratory Biographies

AFRL Video

AFRL's mission is to "create the future." How do we do that? Click here to watch our video!

Business/Special Interest

AFRL Organizational Chart
AFRL Acronyms
AFRL Deployment
AFRL and Literally Black Colleges and Universities
AFRL Personnel Demonstration Project
DoD 1 AFRL (Contracting for Wright-Patt Tech Directorate)
Headquarters Contracting and AFRL-idea Success Opportunities
High Performance Computing Joint Non-Lethal Weapons Program
R&D Partnering with AFRL
Small Business SDB Technology Transfer

AFRL - In the News

Ramothek Seeking Senior Vice of Aircraft, Personnel and Fuel

AFRL to receive Aviation Traffic Trailblazer Award

USAFSA Teams with Innova Systems, Inc. for new color vision test

New Chief Scientist at AFRL Information Directorate in Rome

Alternative fuel with Aviation Week Lakeland award

AFRL Fact Sheets

Air Force Research Laboratory
Air Force Independent Research & Development Program
Air Force Science Fair Program
Air Force Small Business Innovation Research
Air Force Technology Transfer
AFRL Technology Milestones Program

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Research Highlights

Technology Milestones

Armed with Science

Learn the importance of science and technology to military operations and OOD cutting-edge research, development, and education at Armed with Science.

SIAC at Wright-Patterson Air

Technology Directorate

Space Vehicle (RV)
Information (RI)
Air Vehicle (RG)
Propulsion (RZ)
Directed Energy (RD)
Materials & Manufacturing (RM)
Sensors (RY)
Maneuvers (RW)
T11th Human Performance Wing (T11 HPW)
AF Office of Scientific Research (AFOSR)
AFRL Small Business and Grants

Public Affairs

afprl@wpafb.af.mil
(937) 823-3333



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AFRL Role

- **Investigate and evaluate new and emerging technology**
- **Adapt and demonstrate in Air Force applications**
- **Expeditionary, Enduring and Permanent facilities**
- **Evaluates and adapts demonstrated technology to Air Force applications**



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New Technology Work

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**3.2 MW Landfill
Gas Power plant,
Hill AFB**



**14.2 MW PV Array,
Nellis AFB**

**460 KW PV Project,
March AFB**

**122 KW PV Project,
Luke AFB**

**Wind
Turbine
Project,
Tin City**



**Oxygenated
biodiesel test site,
Minot AFB**

**Wind turbines,
FE Warren AFB**



**Ice Storage System,
Dyess AFB**



**Alternative Fuels
Certification Office
& AF Research Lab,
WPAFB**

**1.5 MW Wind
Project, MMR**

**Hybrid Aviation
Refueler,
Shaw AFB**





**Advanced Power
Technology Office,
Robins AFB**

**Facility Energy
Office, Tyndall AFB**

**Alternative
Fueled Vehicles,
Hickam AFB**



 Sites Under Construction
 Center of Excellence

 Demonstration Sites

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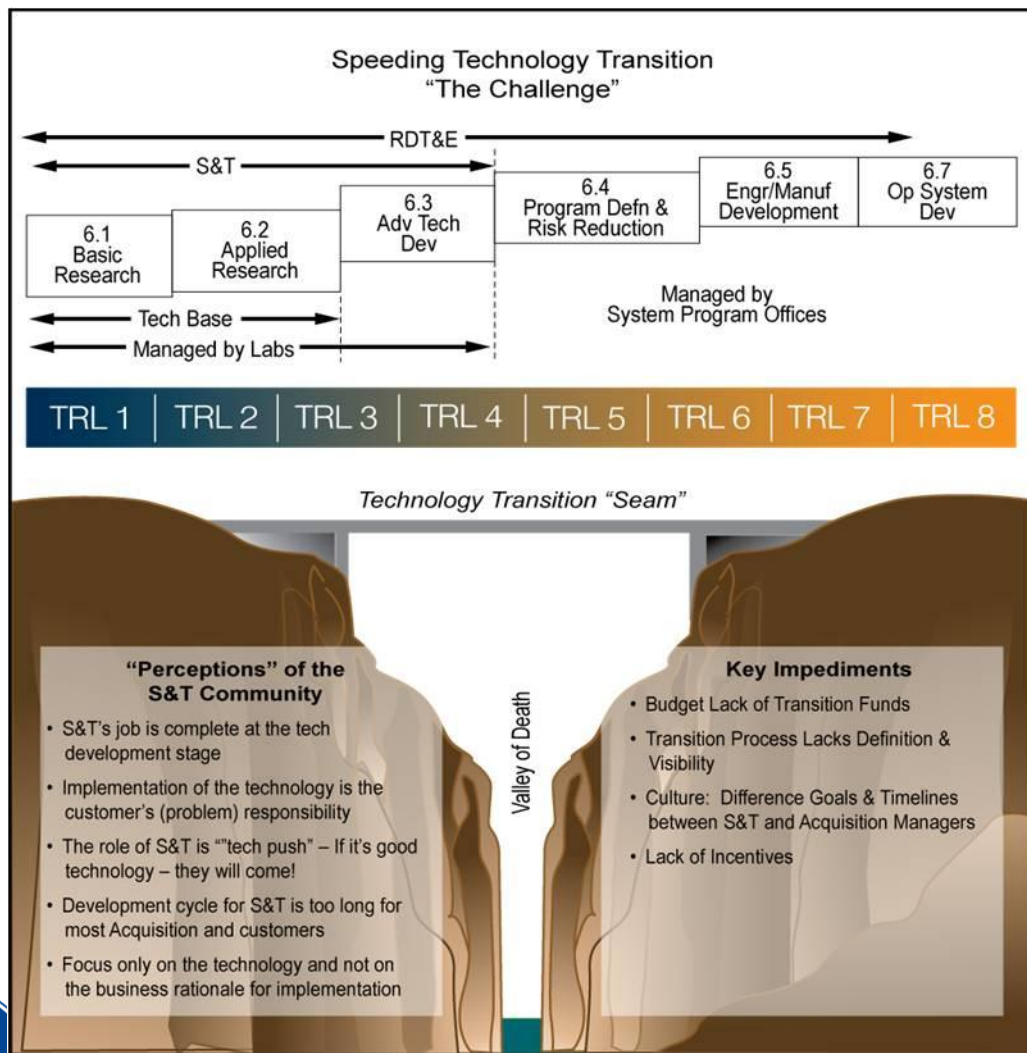
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AFRL Challenge



Overcome (avoid) the valley of death and enable alternative technology/solution implementation:

- Continuous TRL/MRL progression (*from 6.1 through 6.7*)
- Direct link to appropriate stakeholders
- Consider all impacts – performance, readiness, policy, cost, environment, safety, etc.



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Mission Objectives

APTO Mission Statement

Enable the transition and integration of advanced power and alternative energy technologies into the USAF's inventory of ground vehicles, aerospace ground support equipment, Basic Expeditionary Airfield Resources, and base infrastructure through the progression of TRLs while ensuring environmental responsibility.

AFRL

APTO

Research

Development

Testing

Evaluation

Transition



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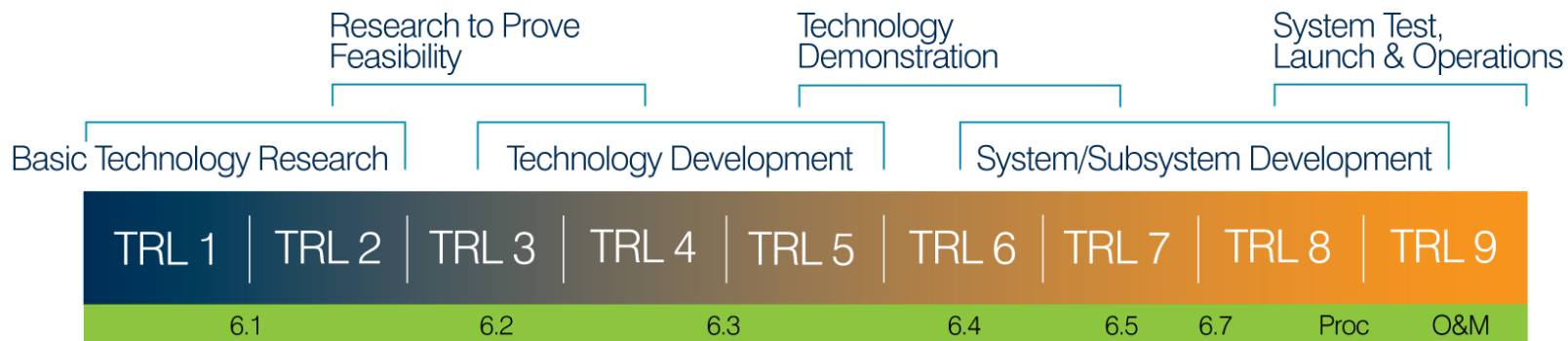
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Technology Approach

- Identify Technologies and Applications
- Assess Applicability
- Mature Performance
- Demonstrate and Validate
- Transition



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Applied Example: Towbarless Vehicle

Research to Prove Feasibility

Technology Demonstration

System Test, Launch & Operations

Basic Technology Research

Technology Development

System/Subsystem Development

TRL 1 | TRL 2 | TRL 3 | TRL 4 | TRL 5 | TRL 6 | TRL 7 | TRL 8 | TRL 9

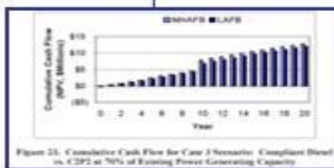


Table 25. Mission Support & Technology Development Costs (in \$ millions)

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Development	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Production	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Training	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Logistics	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10



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***Air Force Center for Engineering
and Environment***



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AFCEE Role

- **RE Technology Types – Emerging, Proven and accepted**
- **Use for Environmental Restoration and MILCON construction**
- **Types of Facilities – Remediation, Permanent**
- **Support work for Environmental Analysis and Impact studies**



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Points of Contact

Position		(850) 283-XXXX
Branch Chief	Ken Gray PE	6357
Subject Matter Expert	Gerald Doddington PE	6222
Project Manager	Mike Giniger PE	6168
Project Manager	Dick Fillman PE	6463
Project Manager	Rafael Marquez PE	6342
Utility Rates Mgr	Nancy Coleal PE	6295

**AFCESA/CENR
139 Barnes Drive
Tyndall AFB, FL 32403**

Remember: 1-888-AFCESA1



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Meeting Renewable Energy Goals

■ Renewable Energy Requirements in MWh (equiv)

	FY11	FY12	FY13	FY14	FY15	FY16
RE Goals	6.5%	7.5%	8.8%	10.2%	11.5	12.9%
RE energy required	1,229,560	1,390,348	1,598,715	1,815,995	2,006,496	2,205,750

■ Mechanism to reach RE goals in MWh

	FY11	FY12	FY13	FY14	FY15	FY16
On-base RE produced	300,026	321,730	448,044	941,633	1,309,597	1,387,852
ECIP/SRM /ARRA On-base Projects	21,704	19,210	187,795	4,389	2,569	-
Commercial Bundled RE Purchases	141,055	141,055	161,305	161,305	161,305	161,305
Utility/third party On-base RE Projects	-	107,103	305,794	363,575	75,686	6,307
RE ENERGY PRODUCED	462,785	589,098	1,102,938	1,470,902	1,549,157	1,555,464
Repl REC Purchases (non additive)	0	107,103	446,830	703,302	473,194	115,926
Goal REC Purchases	766,775	801,250	189,983	345,093	457,339	650,286

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Renewable Energy Fiscal Strategy Requirements

	FY10	FY11	FY12	FY13	FY14	FY15	Totals
Project Type	\$M	\$M	\$M	\$M	\$M	\$M	\$M
ECIP/SRM/ARRA On-Base Project	8.00	4.85	17.20	3.40	11.12	0.00	44.57
Direct Combined RE Purchases	5.30	6.20	6.60	6.80	7.20	7.50	39.60
Third party On-Base Projects	52.20	229.90	43.00	63.90	10.10	0.00	399.10
Purchase RECs	0.20	0.27	1.20	1.65	2.46	3.57	9.35
Totals AF Only	13.50	11.32	25.00	11.85	20.78	11.07	93.52
Total – All Sources	65.70	241.22	68.00	75.75	30.88	11.07	492.62

OVER 80% OF RE INVESTMENTS WILL BE THIRD PARTY INVESTMENTS



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Project Challenges

- **40 USC 591**
 - **Requires Federal entities to conform to state utility regulations**
 - **First required to reach agreement with local regulated provider**
- **Utility Contract Term**
 - **Currently only options are 10 year or indefinite term**
 - **Longer authority (30 yr) would allow better financing arrangements**



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Project Challenges

- **Renewable Energy Certificate Sales**
 - DoE policy – no allowance toward goal if RECs are sold
 - Lack of statutory authority for services to sell RECs
- **Value of Energy Security**
 - No guidance to assign value of energy security benefit
 - Establishing economic value will increase viability
- **Lack of Transmission Service**
 - Wheeling from remote sites may not be available
 - Transmission fully subscribed
- **Use of BLM Withdrawn Land**
 - Energy generation may not be considered military use



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Project Challenges

■ **Environmental Impacts**

- **Need balance between impacts and renewable energy benefits**
- **Difficult to complete NEPA with some technologies which are not specific until after award**
- **NEPA must normally be completed before solicitation**



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Industry Challenges

- **Energy storage for intermittent generation (solar, wind)**
- **Utility standby charges for intermittent generation**
- **Coordination of RE projects and mission impact beyond AF fence lines**
- **Technology area issue examples**
 - **Solar- concentrating solar impacts, glare**
 - **Wind- radar interference, noise, reliability**
 - **Waste to Energy – location and truck traffic/safety, pest control**
 - **Geothermal – expense, potential icing issues**



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Other Air Force Strategies

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- While maintaining execution of known projects, during FY11:
- Coordinate AF best practices and guidance to implement
 - Roof mounted PV arrays
 - Solar PV parking shelters
- Evaluate landfill gas sites
- Investigate any opportunities for wastewater gas capture and use
- Refine targeting for Net Zero feasible AF installations and establish base RE goals based on potential
 - “A net zero energy military installation produces as much energy on-site from renewable energy generation or through the on-site use of renewable fuels, as it consumes in its buildings, facilities, and fleet vehicles.” Net Zero Energy Military Installations: A Guide to Assessment and Planning Booth, Barnett, Burman, Hambrick, and Westby (NREL)



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